

WHAT IS CLAIMED IS:

1. A method of planarizing a surface of a substrate having two or more structures disposed thereon, said method comprising the steps of:

(a) forming a first layer of a first material over the surface and the structures such that the top surface of said first layer has high areas over said structures, low areas between said structures, and transition areas between said high and low areas, said low areas lying substantially within a plane which is below the tops of said structures;

(b) forming a second layer of a second material over at least the low areas of said first layer and with an aperture formed over at least one high area of said first layer and around the corresponding structure underlying said high area, said second material having a resistance to polishing which is greater than the resistance of said first material; and

(c) thereafter polishing the surface such that portions of said first layer and the structures extending above said second layer are removed.

2. The method of Claim 1 wherein the high area underlying said aperture is surrounded by a transition area, and wherein said aperture extends over a substantial portion of said surrounding transition area.

3. The method of Claim 1 further comprising the step of removing said second layer.

4. The method of Claim 1 wherein the step of polishing comprises the step of chemical-mechanical polishing.

5. The method of Claim 4 wherein said second layer comprises a material which oxidizes during chemical-mechanical polishing.

6. A method of forming one or more planarized structures comprising the steps of:

(a) forming a first layer of a first material over the surface of the substrate;

5 (b) forming a polish-stop layer over said first layer;

(c) forming a second layer over said polish-stop layer;

(d) forming a first set of one or more apertures through the composite layer formed by said first, second, and polish-stop layers;

10 (e) depositing a third material within said apertures to form one or more structures in said apertures;

(f) removing said second layer; and

(g) thereafter polishing the resulting exposed surface.

7. The method of Claim 6 wherein the step (b) of forming said polish-stop layer comprises forming a second set of apertures in said polish-stop layer wherein at least one aperture of the second set encircles an aperture of the first set.

8. The method of Claim 6 wherein said second layer comprises a photosensitive material, and wherein the step (d) of forming said first set of apertures comprises patterning exposing said second layer to actinic radiation and thereafter developing.

25 9. The method of Claim 8 wherein said step (d) further comprises the step of etching the exposed portions of said polish-stop layer with an etchant after said second layer has been patterned exposed and developed.

10. The method of Claim 9 wherein said step (d) further comprises the step of plasma etching the exposed portions of said first layer after the exposed portions of said polish-stop layer have been removed.

11. The method of Claim 6 further comprising the step of removing said polish-stop layer after step (g) has been performed.

5 12. The method of Claim 6 wherein the step (g) of polishing comprises the step of chemical-mechanical polishing.

10 13. The method of Claim 12 wherein said second layer comprising a material which oxidizes during chemical-mechanical polishing.

15 4. The method of Claim 6 wherein the step (e) of depositing material comprises plating conductive material within the apertures.

15 15. The method of Claim 6 wherein said third material has a resistance to polishing which is less than the resistance of the material of said polish-stop layer.

20 16. A method of forming planarized structures on a surface of a substrate comprising the steps of:

(a) forming a first layer of a first material over the substrate surface;

(b) forming apertures in said first layer;

20 (c) depositing material within said apertures to form said structures;

(d) removing said first layer;

25 (e) forming a second layer of a second material over the substrate surface and the structures such that the top surface of said second layer has high areas over said structures, low areas between said structures, and transition areas between said high and low areas, said low areas lying substantially within a plane which is below the tops of said structures;

(f) forming a third layer of a third material over said second layer, said third material having a resistance to polishing which is greater than the resistance of said second material; and

(g) thereafter polishing the resulting surface such that portions of said second layer and said structures extending above said plane are removed.

17. The method of Claim 16 wherein the step (f) of forming said third
5 layer comprises the step of forming an aperture over at least one high area of said second layer and around the corresponding structure underlying said high area.

18. The method of Claim 17 wherein the high area underlying said aperture is surrounded by a transition area, and wherein said aperture extends over a
10 substantial portion of said surrounding transition area.

19. The method of Claim 16 wherein the step of polishing comprises the step of chemical-mechanical polishing.

15 20. The method of Claim 19 wherein said second layer comprises a material which oxidizes during chemical-mechanical polishing.

20 21. The method of Claim 16 wherein the step (c) of depositing material comprises plating conductive material within the apertures.

22. A method of planarizing a structure comprising copper (Cu), said structure being formed on a surface of substrate, said method comprising the steps of
(a) forming a polish-stop layer comprising tungsten (W) which is positioned along at least one side of the structure; and
25 (b) polishing the structure in a slurry comprising an abrasive and phosphoric acid (H_3PO_4).

23. The method of Claim 22 wherein the phosphoric acid has a concentration of at least 0.001 percent by weight of the slurry.

24. The method of Claim 22 wherein the phosphoric acid has a concentration of at least 0.01 percent by weight of the slurry.

5 25. The method of Claim 22 wherein said slurry has a pH value of less than 6.0.

26. The method of Claim 22 wherein said slurry has a pH value within the range from 2.0 to 4.0.

10 27. The method of Claim 22 wherein said structure is at least partially embedded in a layer of material which comprises substantially no copper material.

28. The method of Claim 22 wherein a portion of said polish-stop layer is formed over a portion of the structure.

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